

WHAT IS CLAIMED AS NEW AND IS DESIRED TO BE SECURED BY LETTERS

PATENT OF THE UNITED STATES IS:

1. An image reading apparatus, comprising:

an image sensor configured to read an image of an original document to

5 generate read image data;

a shading correction device configured to perform a shading correction on
said read image data; and

an abnormal white image pixel detection device configured to examine a
value of standard white image data on a pixel-by-pixel basis to determine whether
or not pixels are abnormal, wherein the standard white image data is acquired by
reading a white image which is a standard for a shading correction,

wherein a previously specified value is stored for use as the standard
white image data for the pixels that are determined to be abnormal by said
abnormal white image pixel detection device.

2. An image reading apparatus, comprising:

an image sensor configured to read an image of an original document to
generate read image data;

20 a shading correction device configured to perform a shading correction on
said read image data;

an abnormal white image pixel detection device configured to examine a
value of standard white image data on a pixel-by-pixel basis so as to determine
whether or not pixels are abnormal, wherein the standard white image data is
acquired by reading a white image which is a standard for a shading correction;

an image data correction device configured to correct a value of continuous pixels, which is determined to be abnormal when the image of the original document is read, based on a value of a normal pixel around the continuous abnormal pixels on which the shading correction is performed, when the number of the continuous abnormal pixels is within a predetermined allowable number,

wherein a previously specified value is stored for use as the standard white image data for pixels that are determined to be abnormal by said abnormal white image pixel detection device, and wherein the value of the standard white image data for all of pixels in a region in which the number of the pixels which are determined to be abnormal and for which the previously specified value is stored exceeds the predetermined allowable number, is replaced with a predetermined value.

3. The image reading apparatus according to claim 2, wherein the predetermined value is obtained by multiplying a peak value of the standard white image data by a previously determined value of less than 1.

4. The image reading apparatus according to claim 2, wherein the previously specified value is one of an upper limit and a lower limit of the standard white image data.

5. The image reading apparatus according to claim 1, wherein the previously specified value is one of a upper limit and a lower limit of

the standard white image data.

6. An image reading method, comprising:

acquiring standard white image data by reading a white image;

5 determining whether or not the standard white image data is abnormal by
examining the standard white image data on a pixel-by-pixel basis; and

storing a previously specified value as the standard white image data for
pixels that are determined to be abnormal.

7. An image reading method, comprising:

acquiring standard white image data by reading a white image;

determining whether or not the standard white image data is abnormal by
examining the standard white image data on a pixel-by-pixel basis;

correcting a value of a first region of pixels, which is determined to be
abnormal when an image of an original document is read, based on a value of a
normal pixel around the first region on which a shading correction has been
performed, when the number of pixels in said first region is within a predetermined
allowable number;

replacing the value of the standard white image data for the pixels in a
20 second region, in which the number of pixels stored with the previously specified
value exceeds the predetermined allowable number, with a predetermined value.

8. An image reading apparatus, comprising:

an image sensor means for reading an image of an original document to generate read image data;

a shading correction means for performing a shading correction on the read image data; and

5 an abnormal white image pixel detection means for examining a value of standard white image data on a pixel-by-pixel basis to determine whether or not pixels are abnormal, wherein the standard white image data is acquired by reading a white image which is a standard for a shading correction,

wherein a previously specified value is stored for use as the standard white image data for pixels that are determined to be abnormal by said abnormal white image pixel detection means.

9. An image reading apparatus, comprising:

15 an image sensor means for reading an image of an original document to generate read image data;

a shading correction means for performing a shading correction on the read image data;

20 an abnormal white image pixel detection means for examining a value of standard white image data on a pixel-by-pixel basis to determine whether or not pixels are abnormal, wherein the standard white image data is acquired by reading a white image which is a standard for a shading correction;

an image data correction means for correcting a value of continuous pixels, which is determined to be abnormal when the image of the original

document is read, based on a value of a normal pixel around the continuous abnormal pixels on which the shading correction is performed, when the number of the continuous abnormal pixels is within a predetermined allowable number, and

wherein a previously specified value is stored for use as the standard white image data for pixels that are determined to be abnormal by said abnormal white image pixel detection means, and wherein the value of the standard white image data for all of pixels in a region in which the number of the pixels which are determined to be abnormal and for which with the previously specified value is stored exceeds the predetermined allowable number, is replaced with a predetermined value.

10. The image reading apparatus according to claim 9, wherein the predetermined value is obtained by multiplying a peak value of the standard white image data by a previously determined value of less than 1.

11. The image reading apparatus according to claim 9, wherein the previously specified value is one of an upper limit and a lower limit of the standard white image data.

12. The image reading apparatus according to claim 8, wherein the previously specified value is one of an upper limit and a lower limit of the standard white image data.

13. A computer program product including a computer program configured to perform the steps recited in claim 6.

14. A computer program product including a computer program configured to perform the steps recited in claim 7.

15. An image reading method comprising:

reading a white plate to generate white image data comprising white pixel values for respective pixel positions;

examining the white image data to detect abnormal white pixel values;

replacing white pixel values detected as abnormal in the examining step with replacement pixel values to thereby generate shading correction data having at least one region of replacement pixel values;

reading a document to generate document image data comprising document pixel values for respective pixel positions related to said pixel positions of the white image data;

identifying pixel positions of abnormal document pixel values in said document image data;

performing a shading correction on said document image data to replace document pixel values with corrected document pixel values derived through a process that involves using at least said shading correction data and said document image data, to thereby generate corrected document image data; and providing said corrected original image data as an output.

16. A method as in claim 15 in which the step of replacing white pixel values comprises using first replacement values set at one of an upper limit and a lower limit of pixel values in said white image data.

17. A method as in claim 16 in which the step of replacing white pixel values further comprises selectively using second replacement values derived by weighting respective white pixel values with weighting factors of less than unity.

18. A method as in claim 17 comprising using said first replacement values for abnormal white pixel in a region within a first size and using said second replacement values for abnormal white pixels values in a region exceeding said first size.

19. A method as in claim 18 in which said shading correction further comprises replacing selected abnormal document pixel values with document pixel values near a region of the selected abnormal document pixel values.

20. A computer program product comprising a computer program configured to perform the steps of claim 19.

21. A computer program product comprising a computer program configured to perform the steps of claim 18.

22. A computer program product comprising a computer program

configured to perform the steps of claim 17.

23. A computer program product comprising a computer program configured to perform the steps of claim 16.

5

24. An image reading apparatus comprising:

a reading and digitizing station scanning a white plate to generate white image data comprising white pixel values for respective pixel positions, and scanning a document to generate document image data comprising document pixel values for respective pixel positions related to said pixel positions of the white image data;

an abnormal pixel detecting circuit coupled to said reading and digitizing station to receive therefrom said white pixel values and identify abnormal white pixel values;

a shading correction circuit coupled to said reading and digitizing station and said abnormal pixel detection circuit to replace white pixel values identified as abnormal with replacement pixel values to thereby generate shading correction data having at least one region of replacement pixel values, and to use said shading correction data to carry out shading correction of document pixel values to thereby produce shading-corrected document pixel data;

an abnormal pixel correction circuit coupled to the shading correction circuit to identify abnormal pixel values in said document image data and replace selected abnormal pixel values in said shading-corrected document image data with document pixel values not identified as abnormal by the abnormal pixel value

correction circuit.

25. An image reading apparatus as in claim 23 in which said abnormal pixel value correction circuit comprises a system for identifying as selected abnormal pixel values only pixel values for pixels in a region of said document image data below a selected size.